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RESEARCH ARTICLE

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COVID-19 pandemic-related stressors and posttraumatic stress: The main, moderating, indirect, and mediating effects of social support

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Abstract

The COVID-19 pandemic has created a variety of stressors, some of which have been linked to intense stress reactions, such as posttraumatic stress (PTS)-like symptoms. However, we have limited knowledge on cumulative effects of pandemic-related stressors on PTS or on variables that may mitigate the effects of these stressors. We aimed to address some of these knowledge gaps by testing three models to examine the interrelationships among pandemic-related stressors, perceived social support, coping flexibility, and pandemic-related PTS. The sample of this cross-sectional correlational study is comprised of 2291 adults from the United States who completed an online survey between 22 May 2020 and 15 July 2020. Results indicated that greater exposure to secondary stressors, but not COVID-19-related stressors, was associated with increased PTS. After controlling for COVID-19-related and secondary stressors, social support had negative direct and indirect (via coping flexibility) effects on PTS. In addition, social support mediated the effects of COVID-19-related and secondary stressors on PTS. Our findings highlight the complexity of the role of social support in relation to pandemic-related stressors and PTS, and suggest that early interventions that target social support and coping flexibility may help reduce pandemic-related PTS.

KEYWORDS
coping flexibility, coronavirus disease (COVID-19) pandemic, COVID-19-related stressors, pandemic-related secondary stressors, perceived social support, posttraumatic stress

The COVID-19 pandemic has been one of the most impactful pandemics in world history, causing more than five million deaths worldwide as of November 2021. Since first identified in China in late 2019, this new disease—COVID-19—quickly became a pandemic that affected nearly all parts of the world. The rapid spread of COVID-19 has created a myriad of stressors, including disease-related stressors (e.g. infection of oneself or loved ones, hospitalization or death of a loved one due to COVID-19) and other secondary stressors resulting from disease containment efforts, such as financial stressors due to job loss and business closures or increased social isolation due to quarantine and social distancing measures (see Boyraz & Legros, 2020). These stressors and the persistent of threat of infection have resulted in increased levels of distress, such as depressive and anxiety symptoms, throughout the world (e.g. Ettman et al., 2020; for a review, see Xiong et al., 2020).

Some individuals experience intense stress during epidemics and pandemics, which may manifest as posttraumatic stress (PTS)-like symptoms, such as intrusive thoughts, strong negative feelings (e.g. fear, horror, anger), and nightmares (Boyraz et al., 2020; see Boyraz & Legros, 2020; Forte et al., 2020; Karatzias et al., 2020). Recent studies with samples from different countries indicated that many people in the general population of adults have experienced these

types of symptoms during the COVID-19 pandemic. For example, 26.3% of a United States (US) sample (Czeisler et al., 2020), 17.7% of an Irish sample (Karatzias et al., 2020), and 29.5% of an Italian sample (Forte et al., 2020) reported elevated COVID-19-related PTS symptomatology in beginning phase of the pandemic (early or mid-2020).

Research suggests that both disease (COVID-19)-related stressors (e.g. living in highly affected areas, personal exposure to the disease, having family members or friends infected with COVID-19, working as a healthcare worker on the frontlines of the COVID-19 pandemic) and secondary stressors (e.g. job loss, financial stressors) can contribute to increased levels of pandemic-related PTS (see Boyraz & Legros, 2020); however, we have limited information on cumulative effects of these stressors on PTS or on variables that may mitigate the effects of these stressors. Given that many people experienced multiple stressors during the COVID-19 pandemic, the present study examined the cumulative effects and relative importance of COVID-19-related stressors and secondary stressors on PTS. In addition, we examined the role of perceived social support in pandemic-related PTS in order to inform prevention and intervention efforts. Perceived social support refers to the functional aspects of social support, such as perceived availability of emotional, informational, or tangible support (Gjesfjeld et al., 2008; Schwarzer & Knoll, 2007). Several different hypotheses have been proposed and tested in previous literature to understand how social support affects and is affected by stress (e.g. Beeble et al., 2009; Cohen & Wills, 1985; Schwarzer & Knoll, 2007); however, to our knowledge, no study to date has yet comprehensively examined these hypotheses in the context of the COVID-19 pandemic. In the present study, we tested three theory-based models to further our understanding of the role of social support in relation to pandemic-related stressors (i.e. COVID-19-related and secondary stressors) and PTS.

1 | MODEL 1: THE MAIN AND STRESS-BUFFERING EFFECTS OF SOCIAL SUPPORT

Two of the most frequently studied models of social support are the *main effect* and *stress-buffering* models (see Cohen & Wills, 1985). The main effect model suggests that social support provides various benefits (e.g. increased positive affect and feelings of self-worth) and influences well-being in a beneficial manner regardless of the level of stress exposure (Cohen & Wills, 1985). The *buffering model*, on the other hand, suggests that social support provides benefits primarily in the face of stressful events (e.g. promoting more adaptive stress appraisals and better regulation of stress responses), and helps mitigate the deleterious effects of stressful events (Cohen & Wills, 1985).

The main effect model has generally been supported in the literature; however, research on the stress-buffering model has been more inconsistent (e.g. Breet et al., 2014; Dormann & Zapf, 1999; Fortin et al., 2012; see Rueger et al., 2016). Further, longitudinal findings suggest that social support may have a stress-buffering effect after initial exposure to a chronic environmental stressor; however, this buffering effect may disappear over time because prolonged exposure to a stressor may erode social support (Lepore et al., 1991). These findings highlight the complexity of the relationship between stress exposure and social support and suggests that various factors including the nature of the stressful event may enhance or diminish the buffering effect of social support. Therefore, it is important to examine the role of social support in the context of the COVID-19 pandemic and in relation to pandemic-related stressors.

Our first model examined the relationships between pandemic-related stressors (COVID-19-related and secondary stressors) and PTS, as well as the main and buffering effects of social support on PTS. Specifically, we examined the following research questions: 1) Does cumulative exposure to COVID-19 related stressors and secondary stressors predict PTS? 2) after controlling for COVID-19 related stressors and secondary stressors, does social support predict PTS (main effect)? and 3) does social support moderate the cumulative effects of COVID-19-related stressors and secondary stressors on PTS (buffering effect)?

2 | MODEL 2: THE INDIRECT EFFECT OF SOCIAL SUPPORT

Lazarus and Folkman's (1984) transactional theory of stress and the buffering model (Cohen & Wills, 1985) suggest that social support enhances adjustment in the face of stress by promoting adaptive coping appraisals and behaviours. In other words, social support exerts an indirect effect on adjustment through adaptive coping. This hypothesis has been support in cross-sectional and/or longitudinal studies with diverse populations including cancer patients (e.g. Kim et al., 2010), college students (e.g. Saltzman & Holahan, 2002), and survivors of natural disasters (e.g. He et al., 2013).

In light of this literature, our second model examined the indirect effect of social support on pandemic-related PTS through coping flexibility. Coping flexibility refers to the ability to flexibly employ different coping strategies to effectively manage different demands of a stressful situation (Bonanno et al., 2011). In the context of highly stressful or potentially traumatic events, the ability to flexibly use two seemingly opposing coping strategies, namely trauma focus coping (TFC) and forward focus coping (FFC), has been found to be associated with better psychological adjustment (e.g. Bonanno et al., 2011; Galatzer-Levy et al., 2012). TFC involves coping behaviours or strategies that aid in processing the stressful event, such as thinking about the meaning of the event, paying attention to one's negative emotions related to the event, and letting oneself experience these emotions (Bonanno et al., 2011). On the other hand, FFC involves coping behaviours and strategies that minimize one's focus on the stressful event, such as looking for positive aspects of the situation, trying to stay distracted from focussing on the event, or turning one's attention to the needs of others (Bonanno et al., 2011).

Previous research reported significant positive relationships between social support and coping flexibility (e.g. Biao & Yang, 2006; Cheng et al., 2004). Given the previously demonstrated relationships between social support and coping flexibility, and between coping flexibility and resilient responses to stressful events, higher perceived support during the COVID-19 pandemic may enhance coping flexibility, which in turn, may reduce COVID-19-related PTS. To our knowledge, this indirect effect has not been empirically tested in the pandemic literature. Therefore, our second model tested the following research question: After controlling for COVID-19-related stressors and secondary stressors, does social support have a negative indirect effect on PTS through coping flexibility?

3 | MODEL 3. THE MEDIATING EFFECT OF SOCIAL SUPPORT

Another line of research in the social support literature highlights the possible mediating effect of social support on the relationship between stress exposure and psychological functioning; however, there are different perspectives regarding the direction of this mediating effect. One perspective and related findings suggest that prolonged exposure to a stressor may gradually decrease social support and hence reduce well-being (e.g. Beeble et al., 2009; Lepore et al., 1991; Norris & Kaniasty, 1996). Supporting this view, empirical findings suggest that the effect of exposure to certain stressors, such as intimate partner violence (Beeble et al., 2009), natural disasters (Norris & Kaniasty, 1996), and household crowding (Lepore et al., 1991) on psychological functioning is mediated by reduced social support.

Another perspective suggests that exposure to adversity and the resulting stress may have positive effects on individuals' social environment and behaviour (e.g. promoting social-affiliative and prosocial behaviours, increasing meaningful social interactions), which in turn, may improve their psychological functioning (see Mancini, 2019; Mancini et al., 2021). There is empirical support for this perspective as well. For example, using a quasi-experimental cohort design, Mancini et al. (2021) demonstrated that moderate exposure to a natural disaster was associated with increased social support, which in turn, was associated with less distress.

It is important to consider both of these perspectives in the context of the COVID-19 pandemic since pandemics could lead to various stressors, some of which may disrupt individuals' social support networks, whereas others may activate their social support resources. For example, secondary stressors, such as business closures, job loss, and increased work responsibilities may decrease individuals' access to social support or limit their support options, which in turn, may increase their distress. On the other hand, disease-related stressors, such as COVID-19 infection, hospitalization, and loss of a loved one due to COVID-19 may lead to the mobilization of social support resources, which may result in increased perceived support and hence less distress. Indeed, some empirical findings reported a positive relationship between health problems and social support, suggesting that illness or health problems may have support mobilization effects (see Schwarzer & Leppin, 1991). In light of this literature, our third model examined the following research question: Does social support positively or negatively mediate the effects of COVID-19-related stressors and secondary stressors on PTS?

We used gender and a history of a PTSD diagnosis as control variables in our models because identifying as a woman (vs. identifying as a man) and a previous PTSD diagnosis have been identified as risk factors for PTSD (Breslau, 2009). In addition, we controlled for age in all three models since recent findings suggest a negative relationship between age and COVID-19-related PTS (e.g. Boyraz et al., 2020).

4 | METHOD

4.1 | Participants and procedures

After obtaining approval from the Institutional Review Board, participants were recruited via email invitations, social networking sites, online communities (e.g. Reddit, Facebook, Twitter, Instagram, LinkedIn) and psychology-related research websites (e.g. social psychology network). Inclusion criteria for the sample was that participants must be 18 years or older. Data collection took place between 22 May 2020 and 15 July 2020, when many states in the US were implementing non-pharmaceutical interventions (e.g. quarantines, non-essential business closures, stay-at-home orders) to slow the spread of the virus. Participants completed an online survey that included an informed consent form and questionnaires; a subset of the measures are included in the present analysis. There was no incentive for participating in this study.

Although 3093 individuals participated in the study, 709 of these participants were not included in the analyses either because they answered less than 80% of the questions on study questionnaires or had missing values on pandemic-related stressors, age, gender, or a history of PTSD. Among the remaining 2384 participants, 93 reported living in countries other than the US. Because the timeline of the COVID-19 pandemic was different in different countries, we did not include these participants in the present study. The final sample included 2291 adults (mean age = 34.48, *SD* = 10.89). All US states were represented in this final sample with New York (n = 433) and Florida (n = 250) being the most represented states.

The demographic characteristics of the participants and the prevalence of a history of PTSD among participants are presented in Table 1. As can be seen, the majority of the participants (n = 1440, 62.9%) identified their gender as woman; 35.0% (n = 802) identified as man, and 2.1% (n = 49) as non-binary or another gender. The predominant ethnicity among participants was White/European American (n = 1960, 85.6%). The education level of participants ranged from less than a high school diploma (n = 13, 0.6%) to

TABLE 1 Demographic characteristics of the sample

Variable	*n*	%
Gender		
Woman	1440	62.9
Man	802	35
Non-binary/another gender	49	2.1
Race/Ethnicity[a]		
White/European American	1960	85.6
Hispanic/Latinx	99	4.3
Asian/Asian American	72	3.1
Biracial/Multiracial	59	2.6
Black/African American	34	1.5
American Indian/Alaskan native	15	0.7
Middle Eastern	12	0.5
Native Hawaiian/Pacific islander	9	0.4
Other	30	1.3
Relationship status		
Single	706	30.8
Married	1000	43.6
Partnered	451	19.7
Divorced	81	3.5
Widowed	13	0.6
Other	40	1.7
Education level[b]		
Less than a high school diploma	13	0.6
High school degree or equivalent (e.g. GED)	120	5.2
Some college, no degree	420	18.3
Associate degree (e.g. AA, AS)	172	7.5
Bachelor's degree (e.g. BA, BS)	849	37.1
Master's degree (e.g. MA, MS, MEd)	557	24.3
Professional degree (e.g. MD, DDS, DVM)	52	2.3
Doctorate (e.g. PhD, EdD)	83	3.6
Other	24	1.0
History of PTSD		
History of PTSD	188	8.2
No history of PTSD	2103	91.8

Note: $N = 2291$.

[a]One participant did not report their race/ethnicity.

[b]One participant did not report their education level.

doctoral or professional degree ($n = 135$, 5.9%). The most common education level or degree reported by participants was a bachelor's degree ($n = 849$, 37.1%). In terms of the lifetime history of PTSD, 8.2% ($n = 188$) of the participants reported that they have been told by a health professional that they have/have had PTSD.

4.2 | Measures

4.2.1 | Demographic factors and a history of PTSD

The information about the control variables was collected using a demographic questionnaire. Age was measured as a continuous variable. Gender included four levels (man, woman, non-binary, and other) which were dummy coded into two variables (women and nonbinary/other) with men serving as the reference category. Self-reported PTSD history was measured as a dichotomous variable and coded as: 0 = no history of PTSD; 1 = history of PTSD.

4.2.2 | COVID-19 related stressors

COVID-19-related stressors included the following stressors and were measured with a series of questions developed by the second author of the present study: (1) living in an area highly affected by COVID-19, (2) living in the same household as a suspected or confirmed COVID-19 infected person, (3) exposure to COVID-19 as part of one's job (working on the front lines of COVID-19), (4) having a family member who works on the front line of the COVID-19 pandemic, (5) testing positive for COVID-19, (6) hospitalization of a family member, relative, close friend, or colleague due to COVID-19, (7) hospitalization of another person (e.g. an acquaintance or another person) due to COVID-19, (8) death of a family member, relative, close friend, or colleague due to COVID-19 and (9) death of another person (e.g. an acquaintance or another person) due to COVID-19. We scored each stressor on a two-point scale (0 = no, 1 = yes). One item (i.e. "living in the same household as a suspected or confirmed COVID-19 infected person") included an "uncertain" option, which was coded as zero. An overall score (i.e. the total number of COVID-19-related stressors) was computed by taking the sum of these items. The possible scores on this variable ranged from zero to nine.

4.2.3 | Secondary stressors

Pandemic-related secondary stressors were measured using the following items developed by the second author of the present study: (1) job loss or loss of income due to COVID-19 (e.g. closing one's business due to COVID-19 or being laid off from one's job), (2) reduced work hours/reduced income due to the pandemic, (3) loss of health insurance coverage, (4) housing-related problems such as not being able to pay rent or mortgage, (5) other financial difficulties, (6) difficulty accessing food or basic supplies, (7) cancellation of an important life event, (8) social isolation, (9) increased workload and (10) other pandemic-related stressors that caused significant distress. Using a two-point scale (0 = *no*, 1 = *yes*), participants indicated whether they experienced each stressor at any time after the COVID-19 outbreak. A total score was computed by taking the sum of the 10 items (possible range: zero to 10).

4.2.4 | Perceived social support

Perceived social support was measured by the Medical Outcomes Study Social Support Survey (MOS-SSS; Sherbourne & Stewart, 1991), a 19-item self-report instrument that measures four dimensions of perceived social support (i.e. emotional and informational support, tangible support, affectionate support, and positive social interaction). A sample item is: "Someone you can count on to listen to you when you need to talk." Original instructions for the survey ask participants to rate how often each kind of support is available to them if they need it (1 = *none of the time* to 5 = *all of the time*) (Sherbourne & Stewart, 1991). In the present study, we asked participants indicate the extent to which each type of social support has been available to them during the COVID-19 pandemic. An overall social support index was computed by taking the average of 19 items, with higher scores indicating greater perceived support (Sherbourne & Stewart, 1991). The MOS-SSS demonstrated high internal consistency, test-retest reliability, and convergent and discriminant validity among chronically ill patients (Sherbourne & Stewart, 1991) and general populations, such as undergraduate students (Giangrasso & Casale, 2014). In the present study, the Cronbach's alpha coefficient for the total scale was 0.966.

4.2.5 | Coping flexibility

Coping flexibility was measured by the Perceived Ability to Cope with Trauma Scale (PACT; Bonanno et al., 2011), which includes 20 items that measure TFC (e.g. "reflect on the meaning of the event") and FFC (e.g. "remind myself that things will get better") (Bonanno et al., 2011). The original PACT instructions ask participants to rate each item to indicate how able they would be to use a strategy following a potentially traumatic event, if they needed to, using a seven-point scale ranging from 1 (*not at all able*) to 7 (*extremely able*) (Bonanno et al., 2011). In the present study, we asked participants to indicate the extent to which that they were able to use each coping strategy following the COVID-19 outbreak. Following recommendations (see Bonanno et al., 2011), we computed the coping flexibility score using the following steps: After standardizing TFC and FFC scores, we computed a *sum* coping ability score (FFC + TFC) and a *polarity* score (|FFC − TFC|). Then, we obtained a coping flexibility score by subtracting the *polarity* score from the *sum* coping ability score. Using two independent samples, Bonanno et al. (2011) provided support for the reliability and validity of the PACT. In the present study, the Cronbach's alpha coefficients for the TFC and FFC scales were 0.745 and 0.900 respectively.

4.2.6 | Posttraumatic stress (PTS) symptoms

PTS symptoms were measured by the PTSD checklist for DSM-5 (PCL-5; Weathers et al., 2013), which includes 20 self-report items (e.g. "trouble falling or staying asleep" and "feeling jumpy or easily startled") that measure four domains of PTS symptoms (intrusion/re-experiencing, avoidance, negative changes in mood and cognition, and alterations in arousal and reactivity). In order to measure COVID-19-related PTS, we instructed participants to think about how the COVID-19 outbreak affected them within the past month and then rate each item on a five-point scale (0 = *not at all* to 4 = *extremely)* to indicate how much they have been bothered by each problem in the past month, in relation to COVID-19. A total severity score (i.e. the sum of the 20 items) of 31 to 33 on the PCL-5 have shown to be most effective in determining a probable PTSD diagnosis (e.g. Bovin et al., 2016). The reliability and validity of the PCL-5 have been supported in studies with diverse samples including veteran samples (Bovin et al., 2016) and college students (Blevins et al., 2015). In the present study, the Cronbach's alpha coefficient for the overall scale was 0.946.

4.3 | Data analysis overview

Model 1 was examined using a moderated regression analysis. After mean-centring all continuous predictors, we created two interaction terms by taking the product of each predictor (COVID-19 related stressors and secondary stressors) and the moderator variable (perceived social support). Then, we entered the variables into the regression model in the following order: control variables (age, two dummy gender variables, and history of PTSD) were entered in Step 1; COVID-19 related stressors and secondary stressors were entered in Step 2 to examine cumulative effects of these stressors on PTS; social support was entered in Step 3 to examine the main effect of social support on PTS; and the two two-way interaction terms were entered in Step 4 to examine the buffering effect of social support.

Model 2 and Model 3 were examined using a path analysis with maximum likelihood (ML) estimation. These analyses were conducted using AMOS (Version 25; Arbuckle, 2017). Model 2 included six control variables (age, two dummy gender variables, history of PTSD, COVID-19 related stressors, and secondary stressors), one predictor (social support), one mediator (coping flexibility), and one outcome variable (PTS). Model 3 included four control variables (age, two dummy gender variables, and history of PTS), two predictors (COVID-19-related stressors and secondary stressors), one mediator (social support), and one outcome variable (PTS). For both models, we first tested a saturated model in which all possible parameters were freely estimated. Since the degrees of freedom of this model were zero, the model fit indices were not useful; thus, we examined the path coefficients to determine the significance of the direct effects. Based on these results, we tested a trimmed model in which nonsignificant paths were constrained to zero. The trimmed model was assessed for goodness of fit using the following fit indices and cut off values: the comparative fit index (CFI) $\geq$ 0.95; the root mean square error of approximation (RMSEA) $\leq$ 0.06; and the standardized root mean square residual (SRMR) $\leq$ 0.08 (Hu & Bentler, 1999). The significance of the indirect/mediating effects was examined using a bias-corrected bootstrap analysis with 10,000 bootstrap samples.

5 | RESULTS

5.1 | Preliminary analyses

Preliminary exploratory analyses indicated that participants did not have any missing values on control variables (age, gender, PTSD history), COVID-19-related stressors, and secondary stressors. The number of missing values on other variables (i.e. social support, coping flexibility, and PTS items) ranged from one to nine and all participants answered at least 80% of the questions on instruments measuring these variables. After imputing missing values using the expectation maximization method, the overall scores on social support and PTS were computed by taking the means of the items measuring these variables.[1] The coping flexibility score was computed using the procedures summarized in the method section. The means, standard deviations, and bivariate correlations among the study variables are presented in Table 2.

We conducted preliminary exploratory analyses to examine how demographic factors (age and gender) and a history of PTSD were related to COVID-19-related PTS. A correlation analysis indicated a small but significant relationship between age and PTS ($r = -0.130$, $p < 0.001$), suggesting that older age was associated with less PTS. The potential gender differences in PTS were examined using a univariate analysis of variance (ANOVA). The independent factor, gender, included three levels in this analysis: women, men, and nonbinary/other. Results indicated significant gender differences in PTS (F [2, 2288] = 43.157, $p < 0.001$, $\eta^2 = 0.036$). Specifically, individuals who identify as non-binary/other reported significantly higher PTS ($M = 1.673$, $SD = 0.986$) than both women ($M = 1.233$, $SD = 0.837$) and men ($M = 0.936$, $SD = 0.813$). In addition, women reported significantly higher PTS than men. Finally, the results of an independent samples t-test indicated that participants with a history of PTSD reported significantly higher PTS ($M = 1.759$, $SD = 0.964$) than participants with no history of PTSD ($M = 1.083$, $SD = 0.813$), t (2289) = −10.747, $p = < 0.001$, $d = 0.758$.

As preliminary analyses, we also conducted a series of independent samples t-tests with each stressor (COVID-19-related and secondary stressors) to examine mean differences in PTS across different stressors. The results of these analyses, as well as descriptive information about each stressor are presented in Table 3. Results indicated that participants who reported exposure to the following COVID-19-related stressors reported significantly higher PTS than those who did not report exposure to these stressors: living in an area highly affected by COVID-19; exposure to COVID-19 as part of one's job (e.g. working on the front lines of COVID-19); having a family member who works on the front lines of COVID-19; and hospitalization of a family member, relative, close friend, or colleague due to COVID-19. The results of t-tests for secondary stressors indicated that mean differences in PTS were significant across each of the stressor, suggesting that all secondary stressors were associated with increased PTS. The largest mean differences in PTS were observed for the following stressors: loss of health insurance coverage ($d = 0.532$), housing-related problems ($d = 0.654$), social isolation ($d = 0.759$), and other pandemic-related stressors ($d = 0.930$).

5.2 | Main analyses

5.2.1 | Model 1. The main and buffering effects of social support

Table 4 presents the parameter estimates of the hierarchical regression analysis testing Model 1. Results indicated that control variables (Step 1) accounted for 9.4% of the variance in PTS ($R = 0.094$, F [4, 2286] = 59.107, $p < 0.001$). The regression coefficients in Step 1 (see Table 3) indicated that older age was associated with less PTS and a history of PTSD was associated with higher PTS. In addition, participants who identified their gender as woman or nonbinary/other reported higher PTS than those who identified as a man. In Step 2, COVID-19 related stressors and secondary stressors together explained an additional 13.2% variance in PTS, over and above the variance explained by control variables ($\Delta R^2 = 0.132$, ΔF [2, 2284] = 195.352, $p < 0.001$). However, only secondary stressors significantly predicted PTS in this step, suggesting that greater exposure to secondary stressors was associated with higher PTS. In Step 3, the addition of social support to the model resulted in a significant increase in the amount of variance explained in PTS ($\Delta R^2 = 0.047$, ΔF [1, 2283] = 147.781, $p < 0.001$). Social support negatively predicted

TABLE 2 Means, standard deviations, and bivariate correlations among the study variables

	1	2	3	4	5	Mean	*SD*
1. COVID-19-related stressors		0.243*	0.038	0.006	0.115*	1.461	1.312
2. Secondary stressors			−0.117*	−0.213*	0.405*	3.300	1.778
3. Perceived social support				0.397*	−0.257*	3.836	0.990
4. Coping flexibility					−0.449*	−0.695	1.984
5. Posttraumatic stress					-	1.138	0.847

Note: $N = 2291$.

*$p < 0.001$.

TABLE 3 Pandemic-related stressors: prevalence and mean differences in posttraumatic stress

	Did not experience the stressor		Experienced the stressor				
	n (%)	Mean PTS (*SD*)	*n* (%)	Mean PTS (*SD*)	*t*	*p*	*Cohen's d*
COVID-19-Related Stressors							
1. Living in a highly affected area	1302 (56.8)	1.07 (0.84)	989 (43.2)	1.23 (0.85)	−4.54	<0.001	0.189
2. Living with an infected person	2193 (95.7)	1.14 (0.85)	96 (4.2)	1.15 (0.89)	−0.17	0.862	0.106
3. Exposure to COVID-19 as part of one's job (e.g. working on the front lines of COVID-19)	1931 (84.3)	1.12 (0.84)	360 (15.7)	1.23 (0.86)	−2.36	0.018	0.129
4. Having a family member who works on the front line of COVID-19	1571 (68.6)	1.10 (0.84)	720 (31.4)	1.22 (0.85)	−2.99	0.003	0.142
5. Testing positive for COVID-19	2271 (99.1)	1.14 (0.85)	20 (0.09)	0.97 (0.87)	0.91	0.365	0.198
6. Hospitalization of family member, relative, close friend, or colleague due to COVID-19	1923 (83.9)	1.10 (0.84)	368 (16.1)	1.32 (0.88)	−4.41	<0.001	0.256
7. Hospitalization of another person (e.g. an acquaintance) due to COVID-19	1880 (82.1)	1.13 (0.85)	411 (17.9)	1.17 (0.85)	−0.87	0.382	0.047
8. Death of a family member, relative, close friend, or colleague due to COVID-19	2150 (93.8)	1.13 (0.85)	141 (6.2)	1.26 (0.86)	−1.70	0.089	0.152
9. Death of another person (e.g. an acquaintance) due to COVID-19	2048 (89.4)	1.13 (0.85)	243 (10.6)	1.21 (0.86)	−1.43	0.153	0.094
Secondary Stressors							
1. Job loss or loss of income due to COVID-19 (e.g. closing one's business due to COVID-19 or being laid off from one's job)	1721 (75.1)	1.06 (0.83)	570 (24.9)	1.36 (0.87)	−7.21	<0.001	0.353
2. Reduced work hours/reduced income	1471 (64.2)	1.04 (0.82)	820 (35.8)	1.31 (0.87)	−7.15	<0.001	0.319
3. Loss of health insurance coverage	2204 (96.2)	1.12 (0.84)	87 (3.8)	1.58 (0.89)	−4.97	<0.001	0.532
4. Housing-related problems such as not being able to pay rent or mortgage	2146 (93.7)	1.10 (0.83)	145 (6.3)	1.69 (0.97)	−7.13	<0.001	0.654
5. Other financial difficulties	2110 (92.1)	1.09 (0.82)	181 (7.9)	1.66 (0.96)	−7.74	<0.001	0.638
6. Difficulty accessing food or vital supplies	1696 (74)	1.05 (0.82)	595 (26)	1.39 (0.88)	−8.32	<0.001	0.400
7. Cancellation of an important life event	1213 (52.9)	1.07 (0.84)	1078 (47.1)	1.22 (0.85)	−4.32	<0.001	0.178
8. Social isolation	403 (17.6)	0.66 (0.68)	1888 (82.4)	1.24 (0.84)	−14.84	<0.001	0.759
9. Increased workload	1318 (57.5)	1.07 (0.84)	973 (42.5)	1.23 (0.85)	−4.29	<0.001	0.189
10. Other pandemic-related stressors that caused significant distress	1067 (46.6)	0.76 (0.69)	1224 (53.4)	1.47 (0.83)	−22.00	<0.001	0.930

PTS in this step. In Step 4, the interaction terms did not significantly contribute to the amount of variance explained in PTS ($\Delta R^2 = 0.001$, ΔF [2, 2281] = 2.262, $p = 0.104$), suggesting that social support did not moderate the effects of the stressors on PTS. These findings provide support for the main effect model but not for the buffering model.

5.2.2 | Model 2. The indirect effect of social support

Model 2 was examined using a path analysis with AMOS (Version 25, Arbuckle, 2017). The results of the saturated model indicated that all direct paths, except for the path from PTSD history to coping flexibility were significant. Accordingly, we constrained this nonsignificant

TABLE 4 Hierarchical regression analysis testing Model 1

Variable	*B*	*SE*	ß	*t*	*p*	95% CI lower, upper
Step 1						
Age	−0.010	0.002	−0.132	−6.634	<0.001	−0.013, −0.007
Gender (women)	0.276	0.036	0.157	7.744	<0.001	0.206, 0.346
Gender (nonbinary/other)	0.577	0.120	0.099	4.822	<0.001	0.342, 0.812
History of PTSD	0.627	0.062	0.203	10.123	<0.001	0.506, 0.749
Step 2						
COVID-19-related stressors	0.007	0.012	0.011	0.550	0.582	−0.017, 0.031
Secondary stressors	0.174	0.009	0.366	19.075	<0.001	0.156, 0.192
Step 3						
Social support	−0.190	0.016	−0.222	−12.157	<0.001	−0.220, −0.159
Step 4						
Social support X CRS	−0.004	0.013	−0.005	−0.294	0.769	−0.028, 0.021
Social support X SS	−0.017	0.008	−0.037	−1.994	0.046	−0.033, 0.000

Note: History of PTSD is coded as: 0 = no history of PTSD, 1 = history of PTSD.
Abbreviations: CRS, COVID-19-related stressors; SS, secondary stressors.

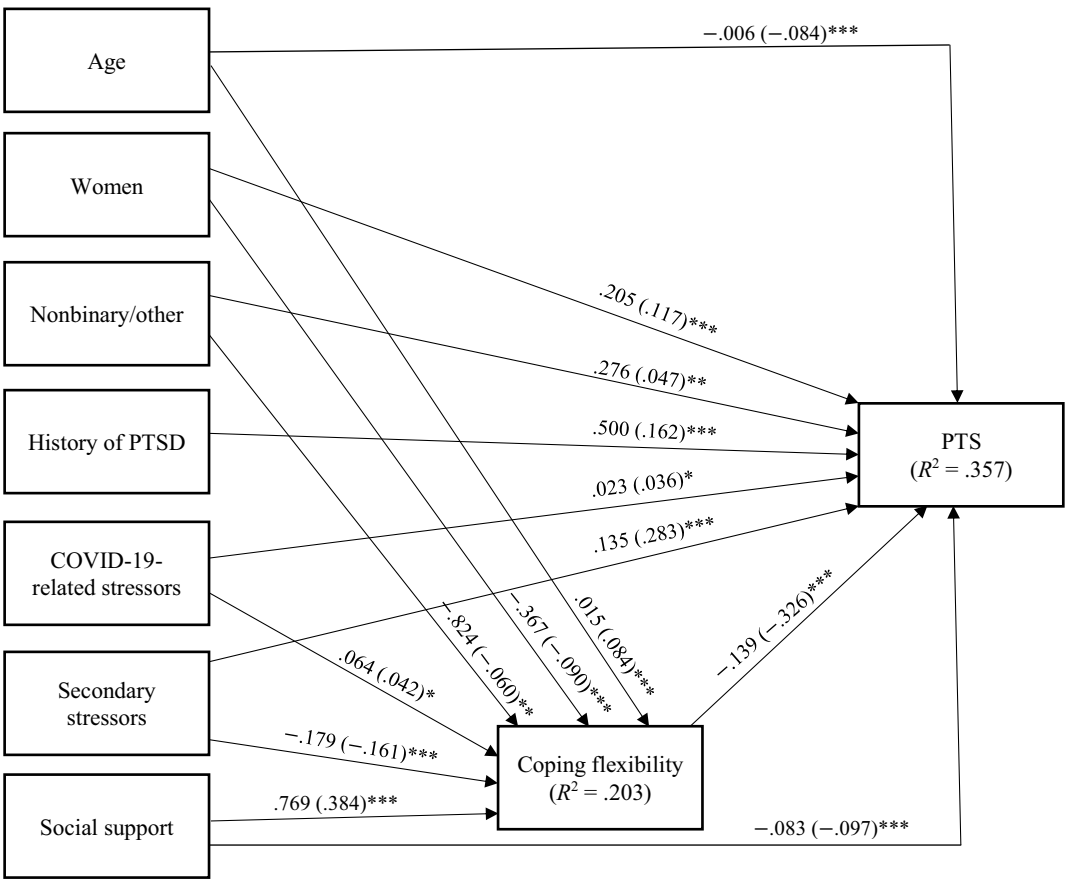

FIGURE 1 Parameter estimates of Model 2. *Note:* Unstandardized path coefficients are provided outside parentheses and standardized path coefficients inside parentheses. PTS, posttraumatic stress. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

path to zero and tested a trimmed model. This modified model had a good fit for the data [$\chi^2(1) = 0.090$, $p = 0.765$, CFI = 1.000, RMSEA = 0.000, SRMR = 0.0009]. The unstandardized and standardized path coefficients of the trimmed model are presented in Figure 1. The examination of direct path coefficients for control variables (see Figure 1) indicated that older age was associated with

greater coping flexibility and less PTS. Compared to men, women and participants who identified their gender as non-binary/other reported less coping flexibility and higher PTS. In addition, a history of PTSD was associated with increased PTS. There were also significant direct effects from pandemic-related stressors to both coping flexibility and PTS. Specifically, greater exposure to COVID-19-related stressors was associated with higher coping flexibility and higher PTS. On the other hand, greater exposure to secondary stressors was associated with less coping flexibility and higher PTS.

After adjusting for control variables, social support had a positive direct effect on coping flexibility and a negative direct effect on PTS. Supporting the indirect effect model, the results of the bootstrap analysis indicated that social support had a significant negative indirect effect on PTS via coping flexibility ($B = -0.107$, $\beta = -0.125$, $SE = 0.009$, 95% CI [−0.125, −0.090]).

5.2.3 | Model 3. The mediating effect of social support

The results of the saturated model indicated that all direct paths in Model 3, except for the direct paths from age to social support and from COVID-19-related stressors to PTS were significant. We constrained these two paths to zero and tested a trimmed model. This model had a good fit for the data [$\chi^2(2) = 4.687$, $p = 0.096$, CFI = 0.998, RMSEA = 0.024, SRMR = 0.007]. The unstandardized and standardized direct effects are shown in Figure 2. The examination of the direct effects of control variables (see Figure 2) indicated that age was negatively, and a history of PTSD was positively related to PTS. There was also a negative direct effect from a history of PTSD to social support, suggesting that participants with a history of PTSD reported less social support than those with no history of PTS. Women reported higher perceived social support and higher PTS than men. Participants who identified their gender as non-binary or another gender reported less perceived social support and higher PTS than men.

After adjusting for control variables, COVID-19-related stressors had a positive, whereas, secondary stressors had a negative direct effect on social support. There was also a significant positive direct effect from secondary stressors and PTS, suggesting that participants who had greater exposure to secondary stressors reported higher PTS. The results of the bootstrap analysis indicated that COVID-19-related stressors had a significant negative indirect effect on PTS through social support ($B = -0.008$, $\beta = -0.012$, $SE = 0.003$, 95% CI [−0.014, −0.002]). On the other hand, the indirect effect of secondary stressors on PTS via social support was positive ($B = 0.014$, $\beta = 0.090$, $SE = 0.003$, 95% CI [0.009, 0.020]).[2]

6 | DISCUSSION

We tested three models in the present study to examine the role of social support in relation to pandemic-related stressors and PTS. The first model examined the cumulative effects of COVID-19-related

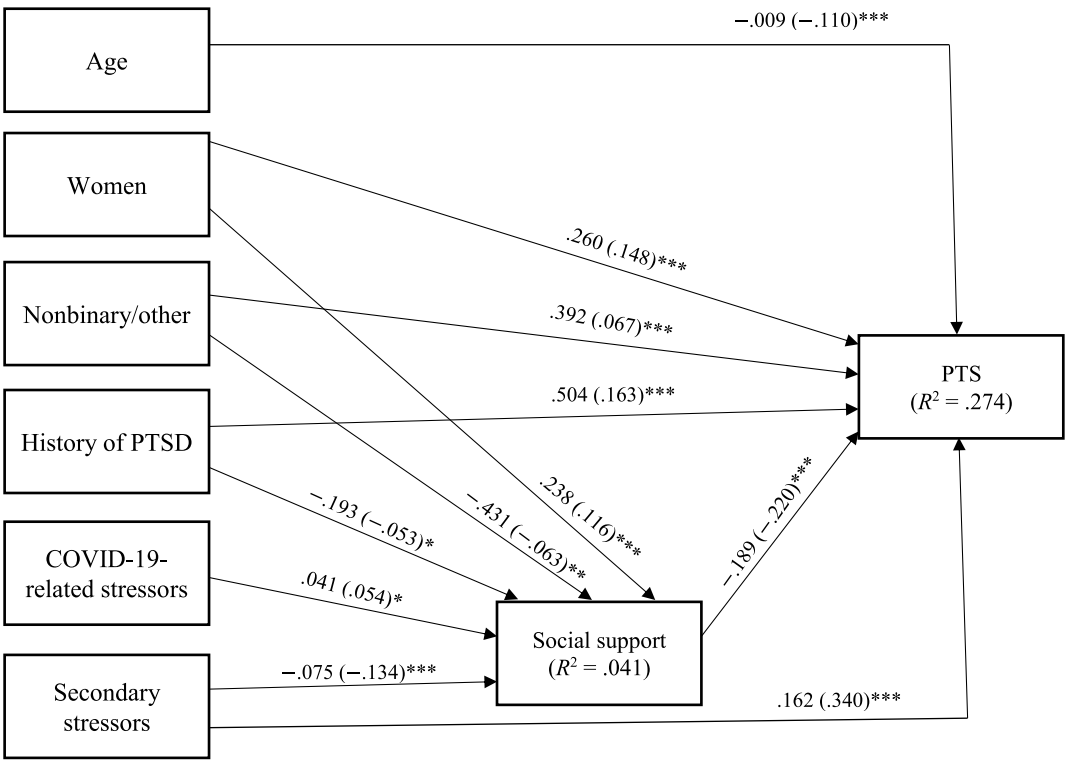

FIGURE 2 Parameter estimates of Model 3. *Note:* Unstandardized path coefficients are provided outside parentheses and standardized path coefficients inside parentheses. PTS, posttraumatic stress. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

and secondary stressors on PTS, as well as the main and buffering effects of social support on PTS. Results indicated that after controlling for demographic factors (age and gender) and PTSD history, the cumulative effect of COVID-19-related stressors on PTS was not significant. On the other hand, greater exposure to secondary stressors was associated with increased PTS. The results of Model 1 also indicated that, after adjusting for control variables (age, gender, PTSD history) and stressors, social support significantly and negatively predicted PTS; however, it did not moderate the effects of COVID-19-related stressors or secondary stressors on PTS. These findings were consistent with the main effect model and suggested that higher perceived support during the COVID-19 pandemic was associated with less PTS.

Our findings did not provide support for the stress-buffering model. As previously noted, the empirical support for the stress-buffering model is inconsistent. It may be that social support buffers against certain stressors, but it may not provide a sufficient buffer in the face of a prolonged pandemic that leads to various social, financial, and health-related stressors. Alternatively, our findings may suggest a buffering effect despite a nonsignificant moderating effect. As noted in the literature, a significant main effect for social support in an at risk population (e.g. individuals who live in poverty) may indicate the presence of a buffering effect; however, this buffering effect cannot be detected without comparing this population to a non-at-risk population (see Rueger et al., 2016). Given that the COVID-19 pandemic has affected all individuals in some way, the significant main effect we reported in this study may suggest a possible buffering effect of social support against the pandemic even though social support did not have a buffering role between the specific stressors we measured in this study and PTS.

Our second model examined whether social support had a negative indirect effect on PTS through coping flexibility. The results of a path analysis indicated that, after adjusting for control variables (age, gender, PTSD history, COVID-19-related and secondary stressors), higher social support was associated with greater coping flexibility, which in turn, negatively predicted COVID-19-related PTS. These findings provide support for the indirect effect model and suggests that coping flexibility may be one of the important mechanisms by which social support may reduce pandemic-related PTS.

Our third model examined whether social support positively or negatively mediated the effects of COVID-19-related stressors and secondary stressors on PTS. Supporting the literature that highlights the positive effects of adversity on social support (Mancini, 2019; Mancini et al., 2021), we found that COVID-19-related stressors had a negative indirect effect on PTS through social support, after adjusting for the control variables. Although this indirect effect was modest, it suggests that exposure to COVID-19-related stressors may increase perceived social support, which in turn, may reduce PTS. Our findings also provided support for the social support deterioration models (Kaniasty & Norris, 1993; e.g. Lepore et al., 1991; Norris & Kaniasty, 1996). Specifically, participants with greater exposure to secondary stressors reported less social support, which in turn, was associated with increased PTS. Taken together, the results of Model 3 suggest that the relationship between pandemic-related stressors and social support may be complex. While some stressors may lead to the mobilization of social support resources and hence reduce PTS, other stressors may increase PTS by reducing social support. It may also be that some stressors have both support mobilization and support deterioration effects. For example, as previously noted, COVID-19-related stressors may have support mobilization effects; however, some of these stressors may increase secondary stressors (e.g. testing positive for COVID-19 may increase feelings of social isolation due to quarantine), which in turn, may reduce perceived support. In other words, while COVID-19-related stressors may have a positive direct effect on social support, some of these stressors may exert a negative indirect effect on social support through secondary stressors.

The present study expands the previous literature by integrating different theoretical perspectives and testing three models to better understand the role of support in pandemic-related PTS. By providing support for the main and indirect effect (via coping flexibility) of social support on PTS, our findings suggest that early interventions that target social support may help reduce pandemic-related PTS. It is important to note however that, due to lack of empirical studies, we have limited knowledge on what type of social support interventions may be effective during a pandemic. Therefore, there is a need for developing and testing social support interventions that can be easily implemented and accessed during health crises that require strict social distancing measures. Considering our findings regarding the mediating effect of coping flexibility, as well as earlier research that highlights the benefits of coping flexibility in the face of stressful events (e.g. Bonanno et al., 2011; Galatzer-Levy et al., 2012), it may be important to combine social support interventions with coping flexibility interventions to improve mental health outcomes associated with epidemics and pandemics.

Our results suggested that the cumulative effects of secondary stressors, but not COVID-19-related stressors, on PTS was significant. While these findings suggest that secondary stressors may be more likely to trigger PTS reactions—which, according to our findings (Model 3), may be partially explained by the social support deterioration effects of secondary stressors—it is important to re-examine these relationships at later stages of the pandemic since more individuals may be affected by multiple or severe disease-related stressors as the pandemic-progresses, which may strengthen the relationship between COVID-19-related stressors and PTS. Alternatively, as we reported in the present study, exposure to COVID-19-related stressors may trigger the mobilization of social support, which may help reduce PTS. Given that our results provided only a modest support for this indirect effect, further examination of this indirect effect using longitudinal methods can provide a more in-depth understanding of the role of social support in relation to disease-related stressors and mental health.

An important limitation of this study, and cross-sectional correlational studies in general, is the difficulty in determining the direction of relationships. In addition, due to the cross-sectional

nature of this study, we may not have fully captured the complexity of the role of social support in relation to pandemic-related stressors and PTS. As previously noted, prolonged exposure to a stressor may gradually decrease social support, which may diminish the buffering effect of social support (e.g. Lepore et al., 1991). We collected our data during the relatively early stages of the pandemic, when COVID-19 cases were increasing across the US and many states were implementing non-pharmaceutical interventions to slow the spread of the disease. The COVID-19 pandemic is an unfolding and evolving world health crisis and the changing circumstances during the pandemic may not only affect the type of stressors individuals experience, but also their social and psychological functioning and coping mechanisms. Therefore, longitudinal studies can provide insights into how interrelationships among pandemic-related stressors, social support, and PTS may change as the pandemic progresses.

Another limitation of this study is related to the characteristics of the participants. Although our sample was diverse with regard to certain demographic factors (e.g. age, geographic location, relationship status), the majority of our participants were White/European American. Considering the differential impact of the COVID-19 pandemic on different population groups (e.g. see Boyraz & Legros, 2020), we need further studies to determine the generalizability of our findings. In addition, our findings indicated that individuals who identify as non-binary/other might be at higher risk of experiencing pandemic-related PTS than men; however, our sample size for individuals who identified as non-binary/other was too small to make generalizations to this population.

Despite these limitations, our study expands the existing literature by testing three theory-based models to better understand the interrelationships among pandemic-related stressors, social support, coping flexibility, and PTS. By providing support for both the main and indirect effects of social support on PTS, our study highlights the importance of social support and coping flexibility in the reduction of pandemic-related PTS. In addition, our findings provide preliminary evidence that pandemic-related stressors may exert indirect effects on PTS by increasing or decreasing social support. Although further longitudinal research is needed to better understand these relationships, our findings suggest that strengthening social support and coping flexibility during the early stages of the pandemic may help reduce PTS.

CONFLICT OF INTEREST

We have no conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author, Mali D. Zaken, upon reasonable request.

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ENDNOTES

[1] When we computed a PTSD severity score by summing all PCL-5 items, 28.8% (n = 659) of the participants met the cutoff score of 33 on the PCL-5.

[2] The results of our supplemental analyses indicated that removing age, gender, and a history of PTSD from Model 1, Model 2, and Model 3 did not change the significance and direction of our main findings.

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